REMARKS

Claims 10, 19, 23, 25, 27, 29, 31, 32, 34, and 36 have been amended to improve their readability and/or to more precisely claim the subject matter Applicants regard as their invention, but not to overcome any rejection offered by the Examiner.

Claims 38-48 have been added to better define the subject matter Applicants regard as their invention. Support for dependent Claims 44-48 is found on page 15 of the specification, for example.

Also, Claim 33 has been amended to more precisely claim the subject matter Applicants regard as their invention.

The Examiner relied on US Patent 5,199,090 to Bell ("Bell") in rejecting all the independent claims, namely, Claims 1, 23, 29, 31, 32, 33, and 34. Bell is directed to magnetooptic recording technology, which is discussed by Bell in general terms in the "Background of the Invention" section of that patent. See, for example, column 1, lines 49-58 of Bell, which discusses how the technique of magnetooptical recording to store information relies on a magnetic domain's orientation:

> In magnetooptical recording, the magnetic media is heated by a light spot to a temperature such that perpendicular magnetic recording is easily accomplished at those heated spots. Information is encoded and is stored in a sequence of magnetic domains along a track in the magnetic layer. The domain magnetization is oriented substantially normal to the surface of the disk or storage media surface, in either of two possible orientations, north pole up or north pole down, for example, depending upon the direction of the applied magnetic field.

In column 15, Bell discusses an embodiment which he describes as a "channel interferometer", which includes, among other things, a channel waveguide, an array of photodiodes, mirrors, and polarizing beam splitters. As discussed on lines 59-64 of column 15:

> Thus the reference TM light mode and the signal TM light mode of the incoming light are compared in order to obtain a light image at the photodetector array ***indicative of the polarization of a magnetic domain in the magnetic media***. The resulting electrical signals at the electrical output of the photodiode array, in the conductors 82a and 82b, are compared in a comparator circuit 79, FIG. 7, which may or may not be included in the slider 70 itself. The comparator output is ***indicative of the state of magnetization of the magnetic media at the point of light reflection***. (emphasis added)

In column 16, Bell goes on to discuss this embodiment further, and it is here that he makes his only reference in that patent to a "surface plasmon":

> Details of the implementation of the polarizing beam splitters are seen enlarged in the plan views of FIGS. 15 and 16 and in an enlarged cross-section in FIG. 18 taken on the line 18--18 of FIG. 15. The polarizing beam splitter 84 is used as an example. ***These polarizing beam splitters utilize thin metal films and the surface plasmon of TM light guided at their interfaces with a dielectric.*** See Surface Plasmon Polaritons in Thin Metal Films, by Johnstone et al in "Journal of Lightwave Technology, Vol. 8, No. 4, April 1990. (emphasis added; see column 16, lines 2-12)

Bell then explains in detail how signal differentiation "is useful in determining the data which is represented by the magnetization states of successive magnetic domains along a track" (column 17, lines 20-23).

The relationship between surface plasmons and polarizing beam splitters is explained in the referenced paper to Johnstone et al., which in the last paragraph concludes:

> The polarization-selective evanescent coupling between a fiber and surface plasmons supported by a thin metal film deposited onto a polished fiber block has been characterized theoretically and experimentally....In addition, a polarizing coupler (beamsplitter) has been fabricated and both types of device have been demonstrated to have high performance...

<u>Thus, surface plasmons in Bell are important only insofar as they are related to the performance of the polarizing beam splitters, and these beam splitters are part of a larger interferometric device used to determine the orientation of magnetic domains</u>.

The role played by surface plasmons in Applicants' invention is altogether different. The Examiner's attention is directed to page 15 of the specification, beginning on line 3, which is reproduced here:

> The waveguide 203 in the various embodiments herein couples light (as used herein, this term includes electromagnetic radiation outside the visible portion of the spectrum) to the optical resonance element 102. The polarization of this light is advantageously perpendicular to the orientation of the ridges 207, so that surface plasmons are set up within the metallic layer 206 as a result of the light's interaction with the array or lattice of features in the metallic layer 206 (in which those features may be ridges or trenches, for example). ***These surface plasmons in turn produce near-field electromagnetic radiation that radiates away from the slit 208 and is thus available to heat the magnetic disk 34. A regular array of features allows the coupling of incident light to surface plasmons, since the features acts as a resonant structure. The increased surface charge motion around the features leads to an increase in the re-radiation of light on the opposing surface and a very large transmission factor.*** The effect is largest when metals with low optical absorption are used, such as gold, silver, copper, and aluminum. Accordingly, the slit 208 acts as an emission region; during writing, its distance over the disk 34 is preferably kept within a wavelength of light (more preferably to within 50 nanometers), so that an intense near-field optical field is directed onto the recording medium. As discussed in more detail below, the near-field light intensity emanating from the slit 208 is considerably enhanced over the transmission intensity one would expect in the absence of the surface plasmon inducing features. Also, the presence of the notches 220 in the slit

> 208 may act to further increase the intensity of the light emanating from the slit. (emphasis added)

Note that the Applicants' claims are directed to subject matter that is not rendered obvious by Bell.

Independent Claim 1, for example, is directed to a method in which a structure has "***an array of features*** that couple the radiation to at least one surface plasmon mode of said structure ***to increase the emitted optical output from said emission region beyond what the emitted optical output from said emission region would be in the absence of said features***" (emphasis added). Note that neither Bell nor the other cited prior art teaches any such array of features, nor do they teach any increase in emitted optical output.

Independent Claim 23 is directed to a method comprising "directing optical radiation onto the ***array of features*** to generate at least one surface plasmon mode, ***thereby enhancing the optical output emanating from an emission region in the metal structure beyond what the optical output from the emission region would be in the absence of the features***" (emphasis added). Neither Bell nor the other cited prior art teaches any such array of features, nor do they teach any enhancement in optical output.

Independent Claim 29 is directed to a method comprising "directing optical radiation onto the ***array of features*** to generate at least one surface plasmon mode, said at least one surface plasmon mode ***enhancing the effective transmission of the optical radiation through the metal structure beyond what the effective transmission would be in the absence of the features***" (emphasis added). Neither Bell nor the other cited prior art teaches any such array of features, nor do they teach any enhancement of effective transmission.

Independent Claim 31 is directed to an apparatus comprising a "structure having an ***array of features*** that ***couple the radiation from one side of said structure to another side of said structure*** to ***increase the emitted optical output from said emission region beyond what the emitted optical output from said emission region would be in the absence of said features***" (emphasis added). Neither Bell nor the other cited prior art teaches any such array of features, nor do they teach coupling radiation from one side of a structure to another side of the structure, nor do they teach increasing the emitted optical output.

Independent Claim 32 is directed to a method that comprises "providing a metal structure having an emission region and ***an array of features*** that ***enhance optical transmission through the emission region beyond what the optical transmission through the emission region would be in the absence of the features***" (emphasis added). Neither Bell nor the other cited prior art teach any such array of features, nor do they teach enhancing optical transmission.

Independent Claim 33 as amended is directed to a method of "***generating surface plasmons*** in a structure, ***in order to direct optical radiation produced by the surface plasmons onto a magnetic medium to heat a portion of the medium*** and thereby facilitate the recording of data". Neither Bell nor the other cited prior art teach the use of surface plasmons to generate optical radiation to heat a magnetic recording medium for the purpose of data recording.

Independent Claim 34 is directed to a method that comprises directing optical radiation onto an "***array of features*** to generate at least one surface plasmon mode, thereby ***enhancing the optical output emanating from an emission region in the metal structure***

beyond what the optical output from the emission region would be in the absence of the features" (emphasis added). Neither Bell nor the other cited prior art teach any such array of features, nor do they teach any enhancement.

Newly added independent Claim 38 is directed to a method comprising "directing input optical radiation onto ***features of a metal structure***, wherein the features have a spatial configuration selected to ***increase optical transmission from an emission region in the structure beyond what the optical transmission from the emission region would be in the absence of the features***" (emphasis added). Neither Bell nor the other cited prior art teaches any such features of a metal structure, nor do they teach any increase of optical transmission from an emission region.

Claims 27, 32, 34, and 40 all include limitations directed to grain sizes of 10-250 cubic nanometers. The Examiner cited US Patent 6,623,874 to Knabe et al. ("Knabe") as teaching grain sizes of "98.91 nm^3". To arrive at this conclusion, the Examiner begins with a statement in Knabe that the average grain size is "5 nm or less". She then arbitrarily assumes that "less" means 3 nm, and then notes that the layer thickness might be as small as 14 nm, in order to calculate the cited volume of 98.91 nm^3. The Examiner has read something into Knabe that is not taught there. (Why stop at 3 nm? Why not assume grain sizes of 1 nm, or 0.1 nm?) An average grain size of "5 nm or less" would most probably suggest to the magnetic technology community that the grain size was about 5 nm, maybe less, maybe not. In any case, the cubic volume of an object 5 nm in diameter and 14 high is greater than 250 nm^3.

With respect to the other dependent claims, Applicants believe that these claims are directed to subject matter that is patentable in combination with the subject matter of their respective independent claims.

A preliminary amendment was filed March 15, 2002 and, according to the PAIR system, was received in the Patent Office. The Examiner indicated in a recent telecon that she had in fact entered this amendment. Nevertheless, she is respectfully requested to confirm this in the next Office communication.

The Examiner is invited to call the undersigned if a telephone conference will expedite the prosecution of this application.

Respectfully submitted,

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